FEASIBILITY OF DEVELOPING A VOCABULARY SUBTEST AND INTEGRATING IT INTO THE WECHSLER ADULT INTELLIGENCE SCALE-REVISED (WAIS-R) IN HONG KONG

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Abstract

The present study attempted to test the feasibility of adapting the Vocabulary subtest of the Wechsler Adult Intelligence Scale-Revised for China (WAIS-RC) into the local testing situation. A total of 276 adolescents from ages 16 to 19, both at school and have quitted school forming an approximate normal distribution of scores were used to establish the item difficulty order of the list of Chinese vocabulary. The results helped to re-order the vocabulary subtest so as to fit into the local setting's usage. The other study was to test the possibility of integration. A group of adolescents totaling 69 were tested on the Vocabulary subtest and other subtests of the WAIS-R (Cantonese Administration). The Vocabulary subtest was correlated with other subtests of the WAIS-R and validated against the results of the Hong Kong Certificate of Education Examination. The present results indicated significant correlations between the developed Vocabulary test and other subtests of the WAIS-R. Factor analysis was performed using the 11 subtests and the results demonstrated that the Vocabulary subtest was related to the Verbal factor. Validity study demonstrated that the test was related to Chinese language ability and general aca-

demic achievement. The feasibility of integrating the Vocabulary subtest into subtests of the WAIS-R (Cantonese Administration) was discussed. In addition, implication for the local testing situation using the WAIS-R was also discussed.

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Statement of Originality

I declare that the present study is the original work of myself. This includes collecting data from various secondary schools, Collison Cape Correctional Institute and Tai Tam Gap Correctional Institute of the Correctional Services Department. The data analysis and the write-up of the report is solely my own effort.

Signed by: _____

Ms. Sonia Chang Suk Yi

30th May 1992

CHAPTER ONE

INTRODUCTION

Use of the Wechsler Adult Intelligence Scale-Revised (WAIS-R) in Hong Kong

The Wechsler Adult Intelligence Scale (WAIS) (Wechsler, 1955) and its revised version, Wechsler Adult Intelligence Scale-Revised (WAIS-R) (Wechsler, 1981) are the commonly used cognitive assessment instruments for clinical and research purposes (Anastasi, 1988). In Hong Kong, the scale also gains its superiority over other scales. According to a study by Tsoi and Sundberg (1989), the WAIS was the most popular assessment tool used among the local practitioners.

There are altogether 11 subtests in the WAIS and WAIS-R, divided into Verbal and Performance scales. The Information, Digit Span, Vocabulary, Arithmetic, Comprehension and Similarities subtests form the Verbal scale. The Picture Completion, Picture Arrangement, Block Design, Object Assembly and Digit Symbol compose the Performance scale.

In the local testing procedure, the Vocabulary subtest of the WAIS or WAIS-R is omitted from the administration. The working party of the Hong Kong Psychologi-

cal Society for the development of the Cantonese administration of the WAIS-R has determined that direct translation of the verbal subtests into Chinese is unreliable and inappropriate. Therefore, the recommended administration of the WAIS-R utilizes only 10 subtests of the WAIS-R, omitting the Vocabulary subtest.

The omission of the Vocabulary subtest of the WAIS in a non-English speaking population is, however, not an unusual procedure. The Chinese translation of WAIS and WAIS-R in Taiwan also omits this scale. As far as the present researcher understood, coordinated research and developments concerning this popularly used test in Hong Kong were scarce, if not non-exist, not to say the Vocabulary subtest.

A newly developed Wechsler Adult Intelligence Scale-Revised for China (WAIS-RC) and its implication

Gong (1982) revised and adapted the WAIS in the People Republic of China (PRC). Several subtests especially the verbal ones were revised to suit the mainland situation. He also developed a new Vocabulary subtest for the WAIS-RC which was absent in Hong Kong and Tai-

wan. In these three Chinese speaking places, despite social, economic and political differences among them, they do share a similar cultural heritage and written language system. The similar cultural background and unified written language system might thus warrant an attempt to validate the mainland China Vocabulary sub-test and further integrate it into the WAIS-R testing procedure in Hong Kong. The following chapter reviews the history of vocabulary tests within the context of major assessment tools.

CHAPTER TWO

LITERATURE REVIEW

Development of Psychological Tests

Psychological testing has traditionally been used to measure differences between individuals or between reactions of the same person on different situations (Anastasi, 1988). Classic examples of measuring differences between individuals include studies of Weber's (1795-1878) and Fenchner's (1810-1887) law of threshold awareness which focused on sensation and perception. The development of psychological tests, previously known as mental tests, has owed much to the work of Galton (1869, 1883). His exploration into human mental faculty marked the later development of mental functioning and intellectual assessment. In Galton's (1869) classic chapter on " Classification of Men According to Their Natural Gifts", he described individual differences, which he believed were inherited and inferred the presence of general ability and specific abilities in individuals. In his later study (1883), he measured a host of psychophysiological variables of visitors to the Kensington Museum. These variables included anthropometric measures such as hand, arm and body length, reaction time, sensory acuity and others (Galton, 1883). Galton referred to

these psychophysiological measures as 'mental tests' in the last century and it was not until 40 years after his pioneer work that the movement of intellectual assessment began.

Significant progress of intellectual assessment began with work of Binet and Simon (1905). Binet refuted the measures of simple sensory processes which were popular among German and American psychologists at his time. Binet refined his concept of intelligence as a global and unitary characteristic that could be assessed by questions which required complex acts of judgment or reasoning (Matarazzo, 1972). In 1905, Binet and his co-worker, Simon, developed the first Binet-Simon Scale (Binet & Simon, 1905) as a preliminary and tentative instrument for sampling intellectual behaviours. The original scale had 30 items which were arranged in ascending order of difficulty. The 1905's scale was developed to sample a wide range of functions which reflected Binet's conception of intelligence. Yet the concept of mental age was not consolidated until the 1908's scale (Binet & Simon, 1908).

In 1908's report, Binet and Simon formally introduced the concept of mental age by listing the three to eight items that could be passed by a majority of chil-

verbal items at the lower end, but as soon as the test reached the 5 year level, the test became increasingly weighted with verbal tests. At the upper end of the mental age continuum, when adolescents or adults might be tested, the test was virtually a test of verbal skills. Such test would pose a problem to testing of adolescents and adults who came from backgrounds which underplayed school learning or whose school experience did not emphasize high-level, verbal-conceptual learning or whose families tended to underevaluate scholastic endeavors (Frank, 1983).

In order to deal with the situation, non-verbal or performance tests were then developed. Such efforts included several popular tests, e.g. the Army Beta Test (Yoakum and Yerkes, 1920), performance scales developed by Grace Arthur (Arthur, 1930) and the Cornell-Coxe Performance Scale (Cornell and Coxe, 1934). Wechsler also followed this line of development in his establishment of his tests (Frank, 1983). The Wechsler-Bellevue Scale (1939) was composed of both verbal and non-verbal tests which were based on a variety of tests including the Army Alpha and Beta (Yoakum and Yerkes, 1920), National Intelligence Tests (Whipple, 1921), tests developed by Arthur (1925, 1930), Healy and Fernald (1911), Terman and Chamberlain (1918) and Pintner and

dren at each age level from three through 13 years. The items were grouped into clusters for different age levels. Based on the mental age concept of Stern (1912), Terman (1916) revised the Binet-Simon scale and developed the Stanford-Binet Intelligence Scale in which the Intelligence Quotient (IQ) or ratio between mental age and chronological age were first used. If a person's mental age was equal to his chronological age, his IQ was exactly 100. An IQ of 100 represented normal or average performance, below 100 indicated "retardation" and those above 100, "acceleration" (Anastasi, 1988).

The ratio IQ seemed to be inappropriate to measure an adult's intelligence because there was little meaningful developmental difference between later ages. Wechsler (1958) has also commented the limitation of using mental age concept arguing the method of mental age failed at about age 12. Another major limitation of employing the ratio IQ was that, unless the standard deviation of the IQ distribution remained approximately constant with age, IQs would not be comparable at different age levels. Wechsler Scales (Wechsler, 1939, 1944) were the first tests to employ a deviation IQ concept in determining intellectual level of individual.

In addition, one of the problems with the Binet Scale was that the test tended to be weighted with non-

Patterson (1917).

The Wechsler Scales of Intelligence

Wechsler's conception of intelligence (Wechsler, 1944) shared a similar view with Binet. Wechsler (1944) stated that "... the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment" as intelligence.

Psychometric properties:

The original Wechsler-Bellevue Scale (Wechsler, 1939, 1944) had 11 subtests. Within the Verbal Scale, there were the Information, Comprehension, Similarities, Arithmetic, Digits (Forward and Backward) and Vocabulary. Picture Completion, Picture Arrangement, Object Assembly, Block Design and Digit Symbol were included in the Performance Scale. The 11 subtests were retained in the revision of the original scale, the Wechsler Adult Intelligence Scale (WAIS) (1955) and in the further revision, the Wechsler Adult Intelligence Scale-Revised (WAIS-R) (1981).

The psychometric properties of the WAIS-R are good. The WAIS-R provides reliable IQs. The reliability coefficient of Verbal IQ was .97, that of Performance IQ

was .93 and that of Full Scale IQ was .90 (Sattler, 1990).

The concurrent validity of the WAIS-R is also impressive. Wechsler (1981) administered WAIS and WAIS-R in counterbalanced order within three- to six-week period on 72 individuals in the 35 to 44 age group of the standardization sample. The correlations between the tests were .91 for the Verbal Scale, .79 for the Performance Scale and .88 for the Full Scale. Various studies comparing the WAIS-R and WAIS demonstrated high correlations between the two (Edwards & Klein, 1984; Kelly, Montgomery, Felleman, & Webb, 1984; Mishra & Brown, 1983; Mitchell, Grandy & Lupo, 1986; Prifitera & Ryan, 1983; Rabourn, 1983; Rogers & Osborne, 1984; Ryan, Rosenberg, & Heilbronner, 1984; Simon & Clopton, 1984; Smith, 1983; Urbina, Golden, & Ariel, 1982; Warner, 1983; Wechsler, 1981).

The concurrent validity study using the WAIS-R and Stanford-Binet: Fourth Edition also obtained high correlations between the two (Thorndike et al., 1986). Correlations between the Stanford-Binet and WAIS-R scales were .90 for the Verbal IQ, .85 for the Performance IQ and .91 for the Full Scale IQ.

Construct validity of the WAIS-R can be inferred from factor analysis because it provides a method for

determining the structure and component of intelligence measured by the test (Sattler, 1990). Factor analysis of the WAIS-R standardization sample also demonstrated that the 11 subtests measured general intelligence (g factor) with a moderate to high degree of success (Blaha & Wallbrown, 1982; Gutkin, Reynolds & Galvin, 1984; O'Grady, 1983; Parker, 1983; and Silverstein, 1982). With its good psychometric properties as discussed above and wide age range coverage (9 age ranges), the Wechsler test is the most frequently employed and well recognized adult intelligence test in assessment and research (Lindeman & Matarazzo, 1984: Lezak, 1983). Several neuropsychologists have also incorporated the WAIS in their clinical and research batteries. (e.g. Reitan & Davison, 1974; E. Russell et al., 1970; A, Smith, 1975)

The Vocabulary subtest

The Vocabulary subtest was not included as a standard test in the early stage of Wechsler-Bellevue Intelligence Scale standardization. A serious objection of the initial inclusion was that a man's vocabulary was influenced by his education and cultural opportunities (Matarazzo, 1972). Yet this discriminating factor proved less serious than initially thought and with its excellence in measuring general intelligence, Wechsler (1941)

strongly recommended it to be a "regular" test. In the WAIS, the Vocabulary Test was then an integral part of the Scale from the start.

The Psychometric properties of the Vocabulary subtest are good. Of the 11 subtests of the WAIS-R, Vocabulary has the highest correlation coefficient with the Full Scale IQ. The correlation coefficient of the Vocabulary subtest with WAIS-R Full Scale was .81, with the Verbal IQ was .85 and with the Performance IQ was .65 (Wechsler, 1981). In addition, it has the highest factor loadings on the g factor. The median loading on the g factor was .87 and the proportion of variance attributed to g was 76% (Sattler, 1990). Therefore, Vocabulary subtest is an excellent single estimate to the general intellectual performance of intact and well-socialized persons (Lezak, 1983).

Estimating deterioration and premorbid functioning is of particular value to neuropsychological work. Neuropsychological assessments which focus on identification and measurement of psychological deficit, depend heavily on indirect methods to obtain a premorbid functioning level. Methods using inference from historical and observational data tended to be unreliable (Lezak, 1983). For many years, using vocabulary score was the most common method for estimating the premorbid ability

(Yates, 1954). The method was based on observations that many patients suffering from organic deterioration still retained relatively intact verbal skills (Lezak, 1983).

Wechsler (1958) found that some subtests of the WAIS were more resistant to age-related mental decline. He maintained that tests such as the "Hold" tests including Vocabulary, Information, Object Assembly and Picture Completion tended to be decline resistant. The "Don't Hold" tests were those that were more vulnerable to age-related mental decline. These tests included Digit Span, Similarities, Digit Symbol and Block Design. By comparing the sum of weighted scores of the "Hold" tests with that of the "Don't Hold" tests, a Deterioration Quotient was obtained. The ratio has a cut-off point of 10%. With that Quotient, the individual's mental deterioration could be estimated. More recently, McFie (1975) also acknowledged the "Hold" test principle and presented his version of deficit indicator. McFie maintained that the sturdiest tests were the Wechsler Vocabulary and Picture Completion subtests. The indicator was calculated from the average of the "Don't Hold" tests including Picture Arrangement, Block Design, Arithmetics, Similarities and Digit Span of the WAIS against the average of the "Hold" tests which were the vocabulary and Picture Completion subtests of WAIS.

Using Wechsler Vocabulary subtest as a valid indicator of premorbid functioning has however been recently questioned. Russell (1972) compared the performance of 103 subjects; 26 with left hemisphere damage, 16 with right hemisphere damage, 40 with diffuse damage and 26 normal and found that all subtests in the WAIS including the Vocabulary were equally affected. Another line of research indicating the depression of Vocabulary test score came from Swiercinsky & Warnock (1977). Therefore, use of the reading test as an indicator of premorbid functioning has been advocated (Nelson & McKenna, 1975; Nelson & O'Connell, 1978). However Nelson & McKenna (1975) have been criticized for they only employed demented subjects. Generalization to other cortically damaged patients was therefore limited (Klesges, Wilkening & Golden, 1981). Another limitation of Nelson and O'Connell' study (1978) was the discrepancy of the t-scores reported and that re-calculated by Klesges, Wilkening and Golden (1978) based on the information given in the article. Thus, using the reading test to estimate the premorbid functioning remains a controversial issue.

Adaptation of the Wechsler Scales

The Wechsler tests have been recognized as the most

commonly employed psychometric instrument in assessing intellectual functioning. Yet it was developed in the United States of America (USA) and its culturally-laden property suggested that the test cannot be used in other languages and places without adaptation or modification. It is especially the case for the verbal subtests (e.g. Information and Vocabulary) because of its heavy reliance on culture and language background. For instance, in the WAIS, question in the Information subtest asks the clients to name several American Presidents. Even in Britain, an English-speaking country as the USA has developed their own version of the WAIS (Saville, 1971). Adaptation was also done on the WAIS-R by Lea (1986). Such changes included substantial modifications in the Information subtest, minor alterations of responses and word definitions in Vocabulary subtest, unit changes in Arithmetic subtest and minor changes in Comprehension and Similarities subtests. Though the 1986 adaptation has made only minimal changes in the Vocabulary subtest, a further study by Smith (1988) indicated that the level of item difficulty of the Vocabulary scale of the WAIS-R on the British population was not comparable to those of the USA. Smith (1988) suggested that there should be some changes in the discontinuing procedure of the WAIS-R Vocabulary subtest to minimize the discrepancy.

In addition, WAIS and WAIS-R have been adapted to other cultures other than the English-speaking ones. Stinissen, Willems, Coetsier and Hulsman (1970) have translated, adapted and tested the WAIS in the Netherlands. There are also Spanish adaptation of the WAIS-R in Argentina (Insua, 1983). Pershad, Verma and Randhama (1980) have revised the verbal scale of WAIS-R to suit the India culture though the Vocabulary subtest is omitted from modification and administration.

Wechsler Scales in Hong Kong

The Wechsler Scales are popular among the local practitioners to determine the intellectual functioning of their clients. The most commonly used psychological tests in Hong Kong are the WAIS and the Hong Kong-Wechsler Intelligence Scale for Children (HK-WISC) (Tsoi and Sundberg, 1989).

Wechsler Intelligence Scale for Children (WISC) in Hong Kong

The first publicly known attempt to adapt the WISC dated back to 1977 when a group of psychologists of the Hong Kong Psychological Society (Hong Kong Psychological Society, 1977) translated the WISC into Cantonese. Certain modifications have been made in the Information

subtest to suit the local culture. However no standardization study has been done.

Large scale development of the locally based test was marked by the Hong Kong-Wechsler Intelligence Scale for Children (HK-WISC, 1981) which was developed by a group of educationalists and clinical psychologists. The HK-WISC was based on the Wechsler Intelligence for Children (WISC) and the Wechsler Intelligence Scale for Children-Revised (WISC-R). Several subtests were modified to suit the local situation, for example, the Information subtest. The Vocabulary subtest was also developed basing on the educational and cultural characteristics of the local children aged 5 to 15 and 11 months.

Reliability of the HK-WISC was satisfactory, with the average split half reliability coefficients ranging from .57 of the Object Assembly subtest to .84 of the Vocabulary subtest. Average reliability coefficient of the Verbal IQ was .91, of Performance IQ was .81 and for the Full Scale IQ was .91 (HK-WISC, 1981). A standardized norm for Hong Kong children was also developed using 1100 children aged 5 to 15. There were 100 children for each age group (HK-WISC, 1981).

In the HK-WISC, Vocabulary subtest also had the highest inter-subtest correlation coefficients with the verbal scale, which on average was .71. In addition, it was the second highest with the full scale score. The correlation coefficient of the Vocabulary subtest with the full scale score was .67 (HK-WISC, 1981).

The Wechsler Adult Intelligence Scale (WAIS) in Hong Kong

The practising psychologists in Hong Kong have translated the WAIS into Cantonese in 1979. Modifications have also been made in several subtests like the Information subtest. The Vocabulary subtest was omitted from translation and administration. As compared to the HK-WISC, there was no extensive nor comprehensive research and development on the adult intellectual tests. No systematic research , thus far has been taken to determine the reliability of the translated version.

In 1989, a research sub-committee of the Division of Clinical Psychology of the Hong Kong Psychological Society prepared the Cantonese translation of the WAIS-R. The subtests of the original English version was either directly translated or substituted by modified items to suit the local context. A pilot study involving 135 adult subjects aged from 16 to 74 was carried out to

refine the modifications and to establish the new item order where appropriate. Again, the Vocabulary test was omitted. In another instance, there was an attempt to adapt the Vocabulary subtest of the HK-WISC into the WAIS. The study showed that there was no prominent ceiling effect and the subtest proved to have fair discriminatory power (Personal communication with Mr. Eddie Li, Senior Clinical Psychologist of the Royal Hong Kong Police Force). No further study has been done on this aspect and the current administration of the Scale included only 10 subtests, excluding the most reliable subtest, Vocabulary in the administration.

Furthermore, in the absence of a local norm, the local clinical psychologists using the WAIS or WAIS-R refer to the norm based on the USA population in determining the intelligence level of the local people. Obviously using the standardization population in the USA which is made up of people of different cultural background and language system from that of Hong Kong, poses many clinical application problems. In fact, the mean IQ of Hong Kong Chinese children was higher than its Caucasian counterpart in the USA and Britain using the Raven's Progressive Matrices (Chan and Lynn, 1989; Lynn, Pagliari and Chan, 1988).

On the other hand, the commonly supported culture-

free subtest, Digit Span, is not virtually freed from cultural heritage. From a psycholinguistic point of view, the digit span of English was longer than Spanish, Hebrew and Arabic (Naveh-Benjamin & Ayerss, 1986). Chinese digit span capacity for its short syllable sound is even longer than the English. Study of Stigler, Lee & Stevenson (1986) demonstrated that the digit span for Chinese adult was 9.2 whereas for English was only 7.2. This indicated that Chinese would perform better in the Digit Span subtest than its American counterpart. Modification has also been made in the HK-WISC. The Digit Span subtest in the HK-WISC was made up of two digit numerals rather than single digit. The norm of the WAIS and WAIS-R which suited the US population is definitely inapplicable for the local population.

With the omission of the Vocabulary test in the present Hong Kong psychological assessment procedure, the potential of the WAIS or WAIS-R is still underdeployed. For instances, the premorbid functioning cannot be estimated. However, people who suffered from brain injuries of various diseases may require neuropsychological assessment to document changes as well as identify strengths and weaknesses. Estimation of premorbid functioning also helps plan rehabilitation program. Accord ing to the Annual Department Report of the Department of Health, the number of in-patients treated (including

deaths) for diseases of nervous system (including meningitis, hereditary and degenerative disorders of the central nervous system, multiple sclerosis, epilepsy and others) was 10,470 in the year 1987-1988 and 10,537 in the year 1988-1989. Another group of patients may benefit from neuropsychological assessment are those in-patients treated for concussion and other intracranial injuries and the number of in-patients treated was 19,210 in the year 1987-1988 and 17,677 in the year 1988-1989. With proper assessment procedure, these patients may benefit.

Besides, as addressed above, there is a need to develop a local norm on the WAIS-R. Vocabulary subtest should then be the first adapted or revised for Hong Kong because of this absence. In addition, the Vocabulary subtest is assumed to have high correlation with the Full Scale IQ and a heavy loading on the g factor of the Scale. The significance of the Vocabulary subtest should not be ignored and thus an adapted version of it should be developed for the Hong Kong people.

The Wechsler Adult Intelligence Scale-Revised for China (WAIS-RC)

Adaptation of the Wechsler tests have been done in the Chinese-speaking places of Hong Kong, Taiwan and People's Republic of China (PRC). The former two have not developed a Vocabulary subtest in the their assessment procedures. Whereas in the PRC, Gong (1989) adapted the WAIS and developed the mainland Chinese revision of the Wechsler Adult Intelligence Scale (WAIS-RC). In addition, two norms for urban and rural areas were developed respectively in the PRC. The standardization sample included 3021 individuals, 992 from rural areas and 2029 from urban areas. The WAIS-RC involved several modifications which have been made according to the local cultural background. For instance, the Information subtest retained only 7 items from the original WAIS and had 22 adapted items. The Digit Span subtest was also extended from a maximum of eight digits in the WAIS and WAIS-R to a maximum of 12 digits in the WAIS-RC. Dai, Gong and Zhong (1990) argued that a high proportion of Chinese respondents were able to recall 8 digits. This may probably related to the difference of digit span of different language systems as mentioned above. The greatest modification has been made on the items of the Vocabulary subtest which were completely revised because the translation of the words in English has multiple

meanings in Chinese. The vocabulary items were selected in consultation with Chinese linguists and according to result of pilot tests (Dai, Gong & Zhong, 1990).

Psychometric properties of the WAIS-RC

Factor analysis of the WAIS-RC also demonstrates satisfactory psychometric properties. The Vocabulary subtest had a factor loading of .92 and .75 for the urban and rural samples respectively. The variances for the subtests ranged from .43 to .70 for the urban samples and from .39 to .71 for the rural ones. The highest variance value was consistently derived from the Vocabulary subtests of both samples (.70 for the urban sample and .71 for the rural sample) (Dai, Gong & Zhong, 1990).

The reliability and validity of the WAIS-RC are also reported. The split-half reliability coefficients ranged from .515 of Object Assembly to .910 of Vocabulary of age group 18-19 (Gong, 1989). Two hundred and eleven subjects were retested within one to five weeks's time to obtain test-retest reliability coefficients. The coefficient for verbal IQ was .82, for performance IQ is .83 and for the Full Scale IQ is .89 (Gong, 1989).

Since the WAIS-RC was the very first intellectual

assessment tool in mainland China, there was no other standardized test to validate the present scale. The validity of the WAIS-RC was then tested against 2 criterion groups of subjects. One group was composed of 29 top students sitting for university entrance examination, with an assumption that they had higher IQs. Another group comprised 136 average high school graduates. The mean IQ of the first group was 112.76 and for the second group is 100.32 (t=7.819; p<0.01) (Gong, 1989). Though the difference between the 2 groups was significant (t=7.819; p<0.01), there was no correlational study done on the WAIS-RC score and the academic achievement of the subjects. Besides, there was no standardized criterion in determining the intellectual ability of the 2 groups.

The Vocabulary subtest of the WAIS-RC

The Vocabulary subtest of the WAIS-RC was an entirely new development of the WAIS and WAIS-R. The criteria of choosing the 40 words was the word frequency appearing in publications and the popularity of its usage in daily life. Most of the words were chosen from the "Table of the Commonly Used Vocabulary" (常用字表) published by the Government of the People's Republic of China in 1952. As mentioned above, there were two standardization studies

done, one for the urban and one for the rural areas. Similarly, the vocabulary list for the urban area was different from that for the rural area. Though they were the same 40 vocabulary items, the order was different. This illustrates that there is regional difference in level of difficulty of the same vocabulary. For the development of the Vocabulary subtests of the WAIS-RC, the level of difficulty was determined by the item order of the vocabulary list. The criterion for the explanation of the vocabularies were based on the " Modern Chinese Dictionary" (Xiandai Hanyu Cidian) (現代漢語詞典). In addition, expert opinion of experienced secondary school teachers and lecturers from Chinese language department in universities were sought.

The Research Problem

Development of a Hong Kong-based Vocabulary subtest

The word usage frequency of the vocabularies of the WAIS-RC could be used as a guide for item difficulty measure. The word usage frequency of the vocabularies of the WAIS-RC was determined using frequency tables. The present study employed two frequency dictionaries published in China and one published in Hong Kong as reference. The two frequency dictionaries published by China

were the " The statistics and Analysis of Chinese Vocabulary" (Hanyu Cihui de Tongji Yu Fenxi) (漢語詞滙的統計和分析) (1984) and " Modern Chinese Frequency Dictionary" (Xiandai Hanyu Pinlu Cidian) (現代漢語頻率詞典) (1985). The former sampled vocabularies mainly from textbooks of both primary and secondary school curriculum in China. The latter had an even wider coverage of vocabularies. It sampled vocabularies from primary as well as secondary school textbooks; newspapers and political articles; general scientific articles; drama and daily conversation scripts and literature including novels, short stories and so on. The Hong Kong-based frequency table used was the " Study of the Chinese Vocabulary of the Hong Kong Junior Secondary School Students" (初中學生中文詞彙研究) (Education Department, 1986). This was the only locally developed word usage frequency dictionary in Hong Kong. Though it sampled vocabularies from textbooks of up to F.3 level, it covered a wide range of reading material, for instance, newspaper and magazines. It was also confirmed that the present frequency dictionary was adequate in assessing the word usage of the general population (Personal communication with Tang, 1992).

The frequency of the vocabulary items of the WAIS-

RC Vocabulary subtest was found (see Appendix A). There was a regional difference between word frequency which was associated with the level of familiarity of the vocabulary. However, the inconclusive word frequency did not indicate the level of difficulty of the vocabulary items.

Dang (1991) also maintained that the Cantonese language has many characteristics of Hong Kong culture which are distinctly different from the PRC. New words were created in Hong Kong because of multiple cultural influences. New concepts and thus new vocabularies from Western countries and Japan were adopted and developed. In addition, Cantonese was a unique dialect. Half of the Cantonese vocabularies are different from most dialects in China. One word therefore might denote different meanings in Cantonese and other dialects. On the other hand, a single meaning or concept might be represented by a different vocabulary in Cantonese and in other places in China. Generally the differences lay in general usage, evaluative tone and conceptualization (Dang, 1991). Therefore, despite a unified written language system of China and Hong Kong, there are vast differences in interpretation and explanation of certain words. This difference thus posed a problem in adapting the China-based Vocabulary subtest into Hong Kong without certain amendments and modifications.

CHAPTER THREE

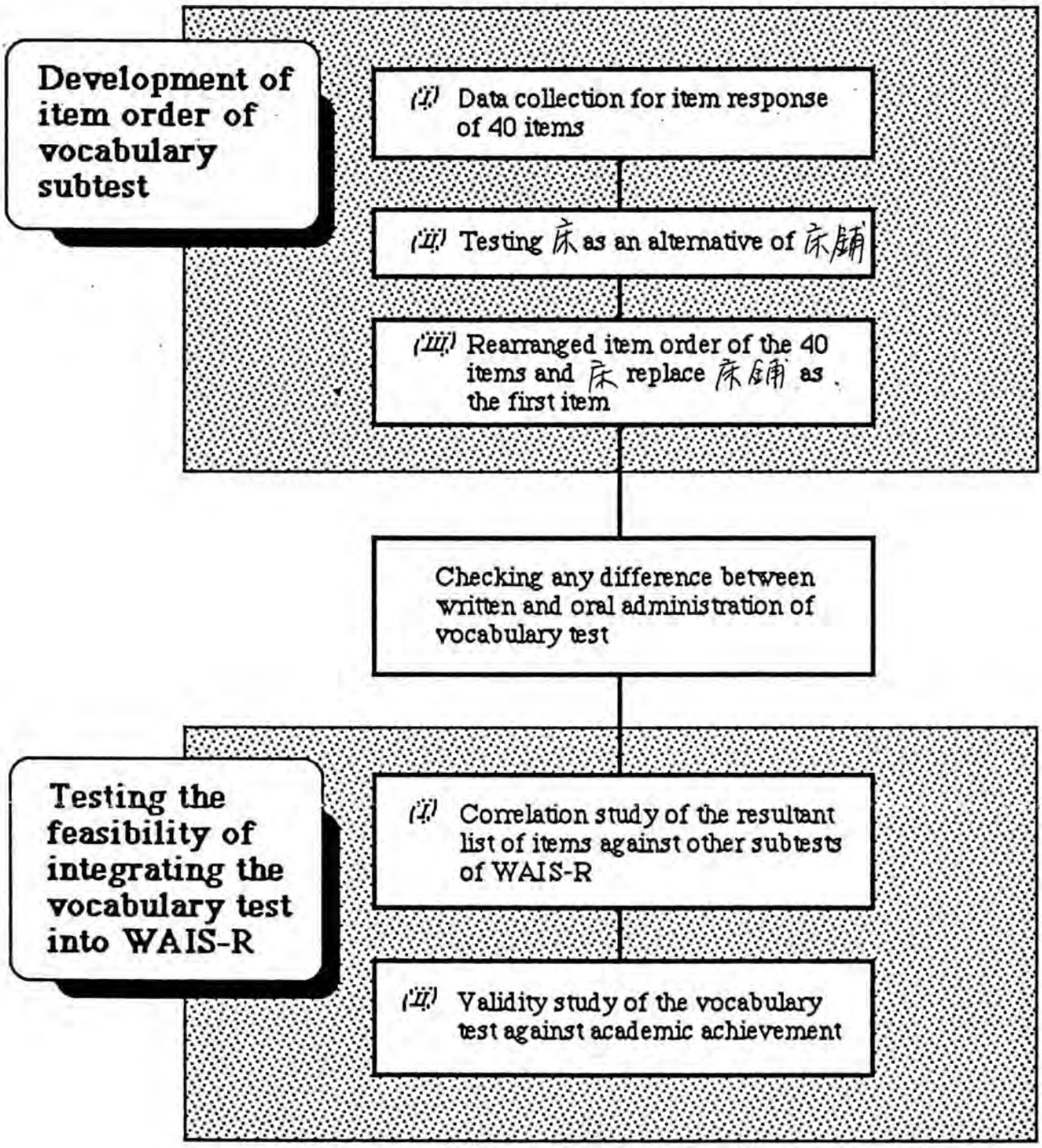
METHOD AND DESIGN

The present study had a perspective towards integrating a vocabulary subtest into the Hong Kong testing situation. Since Gong (1989) has developed the WAIS-RC and a new Chinese Vocabulary subtest, the present study employed the Vocabulary subtest of the WAIS-RC to establish one vocabulary test for the Hong Kong people.

The present research was divided into several studies. The first one was the establishment of the item difficulty level of the Vocabulary subtest of WAIS-RC in Hong Kong. The second was to check whether there was difference between the two modes of administrations, namely, written and oral. The third study examined the feasibility of integrating the list of vocabularies into the WAIS-R (local administration). The final Vocabulary subtest would be correlated against other subtests of the WAIS-R. The validity of the resultant test was also tested against academic achievement of the subjects. A flow chart of the whole development and procedure of the present study was presented in Figure 1.

Figure 1

Chart showing the development and procedure of the present study



Study One

A total of 276 subjects were recruited. They were all within the age range of 16 to 19. Some of the subjects were from secondary schools of different levels of ability. In addition, some subjects who were not in school were recruited through the Correctional Services Department (CSD). For a tabulated presentation of the information of the subjects recruited, please refer to Table 1.

Procedure

The WAIS-RC Vocabulary subtest was administered to all the subjects. (The forty vocabulary items are presented in Appendix B.) They were asked to give an explanation for each word item without a dictionary. Answers to the 40 word items were scored according to the manual of the WAIS-RC. The percentage of pass, inclusive of complete and partial passes for each item was calculated for the item arrangement.

A sub-sample of 222 subjects of the total sample were also required to rate the level of difficulty and familiarity of each word item using a 5-point scale. The rating served to provide a subjective measurement for the word items. The questionnaire used is presented in Appendix C.

Table 1

Demographic information of the subjects recruited

	Institutes														
	1		2		3		4		5		6		7		
Age	a	b	a	b	a	b	a	b	a	b	a	b	a	b	
Male	21	37	4	5	4	12	6	3	10	9	13	6	1	0	131
Female	7	8	15	17	10	14	16	4	11	9	23	6	5	0	145
Total	28	45	19	22	14	26	22	7	21	18	36	12	6	0	276

Note

Institute 1 : Band one secondary school;
Institute 2 : Band one secondary school;
Institute 3 : Band two secondary school;
Institute 4 : Band three secondary school;
Institute 5 : Correctional institutes;
Institute 6 : Band three secondary school;
Institute 7 : Band five secondary school.

"a" denotes age range of 16 to 17;
"b" denotes age range of 18 to 19.

A sub-sample of 142 subjects of the total sample were given an additional word item to answer. The first item of the WAIS-RC was bed "床舖" . In Hong Kong, the same concept was represented by another word which was called " 床 " . In addition, there was no appearance of the word "床舖" in the local word frequency table. Upon this basis, the word item " 床 " was also tested to see if it could replace the original word item "床舖" of the WAIS-RC.

In sum, for the development of the vocabulary subtest, a total of 276 subjects aged 16-19 were recruited. Their level of education ranged from primary 4 to matriculation level. Their responses were scored according to the manual of the WAIS-R and used to establish the item order of the test. Expert advice from Mr. Dang (Senior Lecturer at the Department of Chinese Language and Literature of the Chinese University of Hong Kong) was sought when some of the explanations for the vocabulary items were different from the manual.

Study 2

The usual administration of the WAIS or WAIS-R Vocabulary subtest was a oral one. In the present research, most responses of the vocabulary items were

collected in a written form for it was hypothesized that there was no significant difference between the verbal and written administration of the vocabulary subtest. A counter-balanced administration of the oral and written Vocabulary test was performed to test whether there was a significant difference between the two modes of administration.

Subjects

A total of 89 subjects were included in this study, 49 voluntary subjects from secondary school and 49 subjects from the CSD were also included in this study.

Procedure

For the secondary school students, they have given their written answers to the vocabulary items in the previously study. When they came to the intelligence testing, they were administered the vocabulary subtest orally. Their answers on both testings were used.

For the CSD inmates, the Vocabulary subtest was administered orally first and followed by a written administration within a week's time.

The two test responses were compared using MANOVA repeated measure to see if there was significant difference between the two administrations and if there was any interaction effect between CSD and secondary school subjects and between female and male.

Study 3

In order to test the feasibility of integrating the established vocabulary subtest into the WAIS-R (Cantonese Administration), the subtest was correlated against other subtests of the WAIS-R and validated against the academic attainment of the subjects.

Subjects

Sixty-nine subjects were included in this study. There were 49 secondary school students who have volunteered to participate in the testing. Another 20 CSD subjects who did poorly in the previous vocabulary test were chosen. Those from the CSD were chosen to cover the lower range of the distribution.

Procedure

The WAIS-R 11 subtests inclusive of the re-arranged vocabulary items was administered to each subjects.

The responses of the Vocabulary subtest were scored according to the WAIS-RC manual with additional explanations characterizing the local scene. The amendment and addition of vocabulary explanation are presented in Appendix D. Beginning and discontinuation procedure of the Vocabulary subtest followed that of the WAIS-RC.

Administration of other subtests of the WAIS-R followed the Cantonese administration procedure adopted by the local practitioners.

Since there are cultural and regional differences between Hong Kong and USA and also between Hong Kong and the PRC, the scaled score of the WAIS-R and WAIS-RC was not applicable to Hong Kong. There was also no standardization done in Hong Kong. Thus, the intelligence range of the subjects could not be reliably obtained by referring to the USA standardization norm. Instead the raw score of each subtest was used in the present statistical analysis.

The feasibility of the integrating the final test was studied using correlation procedure of the test with other subtests in the WAIS-R. Furthermore, factor analysis was performed to study the inter-correlation of the Vocabulary subtest with other subtests.

In addition, the Vocabulary subtest was also validated against education attainment of the 49 subjects who had taken the Hong Kong Certificate of Education Examination (HKCEE). An "A" grade would be given a 5 point, a "B" 4 point and so on. A failure would receive a zero point. Since students sat for the different examinations, only the major three examination papers were used, namely Chinese Language, English Language and Mathematics. The mean result of the three examinations was used to correlate with the vocabulary test and other subtests of the WAIS-R (Cantonese Administration).

CHAPTER FOUR

RESULTS

Developing the local vocabulary test: study 1

In developing the Hong Kong-based vocabulary subtest, subjects were recruited from a heterogeneous level of ability. The subjects include adolescents at schools of Band 1 to Band 5 and those not in school. Of the 276 subjects, responses on the vocabulary items approximated a normal distribution. Distribution measures like kurtosis measure was .03 and skewness was -.60 indicating approximate normal distribution when the value approached zero. The mean of the vocabulary test was 45.18 and standard deviation was 11.08. The distribution of the score was presented in Appendix D.

The Vocabulary subtest of the WAIS-R was tested on a group of local adolescents aged 16 to 19. Using the responses of the 276 subjects, the percentage of pass for each item was calculated and was ranked accordingly. The percentage of pass and the rank of each item was shown in Table 2.

Table 2

Percentage of Pass of the 40 Vocabulary items

Item	%Pass	Rank	Item	%Pass	Rank
1	18.0	37	21	65.4	28
2	83.8	12	22	70.0	24
3	94.9	1	23	80.5	16
4	89.9	5	24	75.1	21
5	89.5	7	25	30.4	36
6	90.6	4	26	35.7	33
7	75.1	20	27	57.4	30
8	85.6	9	28	67.5	27
9	80.5	14	29	31.0	35
10	70.4	23	30	74.4	22
11	85.9	8	31	67.8	26
12	80.5	15	32	68.2	25
13	77.2	17	33	59.5	29
14	80.9	13	34	7.6	39
15	76.5	19	35	91.3	3
16	84.8	11	36	52.7	31
17	77.2	18	37	8.3	38
18	94.2	2	38	35.7	34
19	89.9	6	39	50.2	32
20	84.9	10	40	5.1	40

Note. N = 276.

Subjects' ratings of the degree of difficulty and familiarity of the 40 vocabulary items were also ranked and presented in Table 3.

The rank orders of the 40 vocabulary items on the above three measures were tested to see their degree of agreement. The Kendall Coefficient of Concordance among the three rank orders were preformed. The W value for the three rank order was .85 (df=39; $p<.00$) indicating a high degree of agreement between the rank orders of the percentage of pass, level of difficulty and familiarity rated by the subjects.

The resultant list of vocabulary was arranged basing on the percentage of pass of each item. This procedure was also used by Wechsler in his development of the Vocabulary subtest in WAIS-R (Wechsler, 1958).

In arranging the vocabulary items, the percentage of pass for the first vocabulary item of the original subtest of the WAIS-R, bed "床鋪" was low. The pass percentage was 18%, with a rank order of 37th. Content analysis of the responses of this vocabulary indicated that most subjects has mistaken the meaning of bed which was "床鋪" in PRC as blankets and bed cover. Where in Hong Kong, one referred to one's own bed as "床" only.

Table 3

Level of difficulty and familiarity of word item rated by subjects

Items	Difficulty	Rank	Familiarity	Rank
1.	2.27	10	1.87	11
2.	2.06	3	1.48	1
3.	1.79	1	1.98	13
4.	2.14	6	1.71	4
5.	2.06	4	1.55	3
6.	2.12	5	1.74	6
7.	2.71	23	2.28	23
8.	2.32	12	2.18	21
9.	2.24	9	1.86	10
10.	2.60	17	2.15	20
11.	2.60	18	2.31	25
12.	2.83	29	2.20	17
13.	2.58	16	2.25	22
14.	2.61	20	2.45	30
15.	2.42	14	1.99	14
16.	2.40	13	1.85	8
17.	2.15	7	1.85	9
18.	1.87	2	1.51	2
19.	2.28	11	1.72	5
20.	2.21	8	1.81	7
21.	2.79	27	2.44	29
22.	2.60	19	2.10	18
23.	3.08	34	2.45	31
24.	2.50	15	1.89	12
25.	3.12	35	2.76	35
26.	2.95	31	2.09	16
27.	3.27	37	2.95	37
28.	2.67	22	2.36	27
29.	2.76	26	2.14	19
30.	2.71	24	2.36	28
31.	2.74	25	2.07	15
32.	2.82	28	2.30	24
33.	2.84	30	2.69	34
34.	3.72	39	3.63	39
35.	2.64	21	2.33	26
36.	3.07	33	2.84	36
37.	3.52	38	3.14	38
38.	3.18	36	2.53	32
39.	3.01	32	2.54	33
40.	4.43	40	4.41	40

Note

The scores presented were the mean score for each rating.

When the vocabulary "床" was tested using 142 subjects, the pass percentage of the 41 vocabularies was shown in Appendix E.

The item order of the first half of the vocabulary test showed degrees of discrepancy between those obtained using the whole sample. Nevertheless, the item order of the later half vocabularies was generally similar to that obtained using 276 subjects. Since the score of the whole sample resembled a normal distribution, the original rank order was still preserved in devising the final order of the vocabulary items.

When the word "床" was tested as alternative for the original word item "床鋪" in the WAIS-RC, the responses of the 142 subjects on "床" had a pass percentage of 95% which was the second rank. The first was the orchard "果園" having a pass percentage of 97.2%. "Orchard" also ranked very high in the normalized sample, 94.9%. In determining the order of these two vocabularies, bed "床" was preferred to put in the first rank because it had a higher percentage of complete pass than the word item, orchard "果園". The complete pass percentage for "bed" "床" was 87.3 while for "orchard" "果園" was 83.1. In addition, "bed" was more familiar to the local people and was one

of the daily seen furniture. Therefore the final list of the vocabulary items was arranged and presented in Table 4.

Study 2

A MANOVA was performed to test whether there was difference in vocabulary score administered in the form of written and verbal responses. A two level repeated measure MANOVA was performed. The repeated measure was the two score obtained from written and verbal administration in secondary school subjects and in a counterbalanced manner, verbal and written administration in the Correctional subjects. There were no significant differences found between the two administrations (F=1.92; p<.169). Sex effect was not significant (F=.90; p<.344). Institution effect (secondary school students vs CSD subjects) was also insignificant (F=1.01; p<.317). Furthermore, there was no interaction effect between Sex and Institution (F=.16; p<.686). A tabulated presentation was contained in Table 5.

Table 4

Final list of vocabulary items

(With English Equivalents)

1.	床	Bed	21.	曲折	Tortuous
2.	果園	Orchard	22.	進步	Improve
3.	冬天	Winter	23.	約束	Restraint
4.	笑柄	Laughing-Stock	24.	謙虛	Humble
5.	通知	Inform	25.	大方	Generous
6.	修理	Repair	26.	規矩	Custom
7.	和平	Tranquil	27.	距離	Distance
8.	疲倦	Fatigued	28.	果斷	Decisive
9.	偽裝	Pretend	29.	顛倒	Reverse
10.	豐收	Abundant Harvest	30.	堡壘	Castle
11.	糧食	Food	31.	器重	Valued
12.	勝利	Champion	32.	淵博	Erudite
13.	美麗	Beautiful	33.	妥協	Compromise
14.	伙伴	Companion	34.	新鮮	Fresh
15.	工具	Tool	35.	系統	System
16.	速度	Speed	36.	矛盾	Contradiction
17.	基礎	Foundation	37.	機關	Organization
18.	堅定	Persistent	38.	里程碑	Milestone
19.	輪船	Steamer	39.	準繩	Criterion
20.	產品	Product	40.	剽竊	Plagiarize

Table 5
ANOVA table for oral and written administration of the Vocabulary subtest

Source	SS	df	MS	F	p
Raw	36.99	1	36.99	1.92	n.s.
Sex X Raw	17.39	1	17.39	.90	n.s.
Sch X Raw	19.45	1	19.45	1.01	n.s.
Sex X Sch X Raw	3.17	1	3.17	.16	n.s.

Note. Abbreviation for Sources: Raw - Raw Score; Sch - School.

Study 3

Correlation Study of the re-arranged vocabulary subtest

A total of 69 WAIS-R were administered. 34 subjects were male and 35 were female. Raw score of each subtest was used to calculate the inter-subtest correlation coefficients.

The mean, standard deviation, range of score of each subtest were presented in Table 6.

A inter-subtest correlation procedure was performed using the 11 subtests. The correlation matrix for the 11 tests was presented in Table 7.

The Vocabulary subtest correlated highly with most of the subtests of the WAIS-R. The highest correlation was .88 ($p<.001$) with the Information subtest, followed by that with the Similarities ($r=.82$; $pp<.001$). Correlation coefficients with Comprehension was .76 ($p<.001$). Within the verbal area, the lowest correlation was with the Digit Span ($r=.28$; $p<.01$).

The Vocabulary subtest also correlated with the non-verbal tests. The correlation coefficients ranged from .41 to .58 ($p<.001$).

Table 6

Statistics of the 12 subtests

Test	Mean	s.d.	Range	Min.	Max.
Information m.s.= 29	15.86	6.03	22.00	3.00	25.00
Digit Span m.s.= 28	21.42	3.38	13.00	11.00	27.00
digit forward m.s.= 14	12.44	1.39	5.00	9.00	14.00
digit backward m.s.= 14	9.00	2.77	11.00	2.00	13.00
Vocabulary m.s.= 80	46.39	13.50	54.00	14.00	68.00
Arithmetic m.s.= 19	12.80	3.32	13.00	6.00	19.00
Comprehension m.s.= 32	15.99	5.28	19.00	5.00	25.00
Similarities m.s.= 28	15.87	5.24	20.00	5.00	25.00
Picture Completion m.s.= 20	13.97	2.51	12.00	7.00	19.00
Picture Arrangement m.s.= 20	12.60	3.89	16.00	2.00	18.00
Block Design m.s.= 51	36.71	10.24	39.00	12.00	51.00
Object Assembly m.s.= 41	28.71	5.97	26.00	15.00	41.00
Digit Symbol m.s.= 93	73.26	11.26	54.00	39.00	93.00

N=69

Note : m.s. denotes maximum score possible
Min. denotes minimum score of the subjects;
Max. denotes maximum score of the subjects.

Table 7

Correlation matrix for the eleven subtests

	INFM	DIGSP	VOCB	ARIT	COMP	SIML	PICT	ARNG	BLOK	OBJA
DIGSP	2321									
VOCB	8795**	2803*								
ARIT	6925**	4986**	6651**							
COMP	6801**	2425	7610**	5582**						
SIML	8008**	3240*	8187**	6266**	5929**					
PICT	5330**	1759	5736**	4788**	2714	6045**				
ARNG	4837**	3755**	4710**	4109**	2623	5180**	5220**			
BLOK	5841**	3048*	5883**	5969**	4598**	5272**	4198**	4589**		
OBJA	3681**	0287	4187**	3511*	2670	3354*	4481**	4051**	5177**	
DIGS	4610**	2212	4456**	4302**	4101**	4936**	3852**	1796	4512**	1646

Note. N = 69. All decimal points ignored. Asterisks for one-tailed significance: * p<.01; ** p<.001. Abbreviations: INFM = Information; VOCB = Vocabulary; ARIT = Arithmetic; COMP = Comprehension; SIML = Similarities; PICT = Picture completion; ARNG = Arrangement; BLOK = Block design; OBJA = Object assembly; DIGS = Digit symbol; DIGSP = Digit span.

On the other hand, Digit Span had the least correlation with other subtests of the WAIS-R. It correlated with only five of the subtests of the WAIS-R (Cantonese Administration). Digit Span correlated highly with Arithmetic (r=.50; p<.001). It had moderate correlations with Vocabulary, Similarities, Picture Arrangement and Block Design. The correlation coefficients ranged from .28 to .38 (p<.01).

Factor Analysis of the subtests

Factor analysis of psychological test was usually performed to establish the construct validity of the test. In the previous studies of construct validity of the WAIS and WAIS-R, scale scores were usually employed to determine the factors. In the present study, it was not possible to employ the scale score in the statistical analysis. Therefore, the present factor analysis was used to further infer the inter-correlation of the Vocabulary subtest with other subtests of the WAIS-R.

A factor analysis procedure was performed on the raw scores of the eleven tests (maximum likelihood), followed by a varimax rotation. The one-factor, two-factor and three-factor solutions are presented in Table 8.

The one-factor solution was usually assumed to have a g intelligence factor. Vocabulary subtest had the highest factor loading in the one-factor solution. The loading for the Vocabulary subtest was .94, followed by factor loading of .92 of the Information subtest. The results suggested that the Vocabulary subtest was highly related to the g factor. In fact, all subtests of the WAIS-R had a factor loading of greater than .40 except the Digit Span subtest. Digit Span had a factor loading of only .33.

In the two-factor solution, subtests could be grossly divided into two factors characterizing verbal and non-verbal abilities. Information, Vocabulary, Arithmetic, Comprehension, Similarities and Digit Symbol formed one factor. Digit Symbol had been found to be loaded on the Verbal factor in Gong's (1990) study. Some subtests of the Verbal factor also shared a significant loading with the other one. For instance, Information, Vocabulary, Arithmetic and Similarities had factor loadings of .40 or more on the other factor. The other

Table 8
Factor loadings of the eleven subtests on various extractions

Subtest	Factor(s) Extracted					
	One	Two		Three		
		I	II	I	II	III
INFM	9200	7857	4709	7942	4604	0698
DIGSP	3320	1805	3245	1595	0801	9834
VOCB	9441	8451	4510	8421	4394	1126
ARIT	7423	5562	4937	5665	3890	3835
COMP	7428	8203	1294	8283	0869	1052
SIML	8666	6664	5582	6676	5274	1782
PICT	6160	2791	7029	2643	7466	0752
ARNG	5377	1956	6829	2041	6113	2989
BLOK	6531	4296	5294	4468	4655	1996
OBJA	4432	2055	5007	2115	5343	-0486
DIGS	5135	4034	3112	4087	2767	1362

Note. N = 69. All decimal points ignored. Abbreviations: INFM = Information; DIGSP = Digit span; VOCB = Vocabluary; ARIT = Arithmetic; COMP = Comprehension; SIML = Similarities; PICT = Picture completion; ARNG = Arrangement; BLOK = Block design; OBJA = Object assembly; DIGS = Digit symbol.

factor extracted was comprised of Picture Completion, Picture Arrangement, Block Design and Object Assembly. Block Design was also loaded heavily with the Verbal factor. The present extraction, generally simulated Verbal Comprehension and Perceptual Organization described by Cohen (1957) though some tests loaded heavily on both factors.

In the Verbal factor, Vocabulary subtest had the highest loading on the factor. Factor loading of the Vocabulary test on the Verbal factor was .85 while on the Perceptual Organization factor was .45. The second high loading went to Comprehension subtest which was .82. The result reflected that the Vocabulary test was a good indicator of verbal ability.

In the three-factor solution, the factor components of the first two factors were basically the same as the two-factor solution. The first factor was composed of Information, Vocabulary, Arithmetic, Comprehension, Similarities and Digit Symbol. The other factor included Picture Completion, Picture Arrangement, Block Design and Object Assembly. The third factor was constituted by a single subtest of Digit Span.

The Vocabulary subtest again loaded heavily on the Verbal factor. It had the highest factor loading among

other subtest. Factor loading on the verbal factor was .84, on the Perceptual Organization factor was .40 and on the third factor was .11. Vocabulary subtest was consistently a good indicator of verbal ability.

The communality of each subtest for the unrotated maximum likelihood factor analysis was used to estimate the common variance of the subtest. Communality values of the 11 subtests were presented in Table 9.

In the present study, the Vocabulary subtest had the highest communality value which was .87. Thus it is suggested that Vocabulary subtest could be regarded as the most reliable and stable measure among other subtests. On the other hand, three subtests could be regarded as least reliable measures. They were the Digit Span, Object Assembly and Digit Symbol. The communality value for the three subtests were .41, .41 and .37 respectively.

Validity study of the Vocabulary subtest

A concurrent validity study was performed. The 11 subtests of the WAIS-R were correlated with the three main examination results of the Hong Kong Certificate of Education Examination (HKCEE), namely Chinese

Table 9

Communality values for each subtest

Test	Communality
Information	.83
Digit Span	.41
Vocabulary	.87
Arithmetic	.65
Comprehension	.64
Similarities	.75
Picture Completion	.55
Picture Arrangement	.48
Block Design	.55
Object Assembly	.41
Digit Symbol	.37

Note
The communality values were estimated from the unrotated maximum likelihood factor analysis.

Language, English Language and Mathematics and their mean. The results of the HKCEE of the subjects was scored according to the grades gained. The results of the correlation procedure was presented in Table 10.

Vocabulary subtest was significantly correlated with the Chinese Language examination result. The correlation coefficient was .40 ($p<.01$). The results reflected that the Vocabulary subtest was moderately related to Chinese language ability.

Vocabulary subtest also had a significant correlation with the mean of the three tests. Correlation coefficient of the Vocabulary subtest with the mean of three HKCEE results was .33 ($p<.01$). The finding demonstrated that the Vocabulary subtest was related to general academic achievement.

Table 10

Correlation coefficients of three Hong Kong Certificate of Education Examination Papers and their means with the 11 subtests of the WAIS-R

	HKCEE Subjects			
Test	CHI	ENG	MATHS	MEAN
Information	.26	.16	.30	.34*
Digit Span	.04	.19	.47**	.32
Vocabulary	.40*	.13	.19	.33*
Arithmetic	.14	-.03	.51**	.27
Comprehension	.27	.15	.32	.34*
Similarities	.09	-.04	.10	.06
Picture Completion	-.13	.01	.04	-.04*
Picture Arrangement	-.03	.06	.07	.05
Block Design	.29	-.15	.31	.18
Object Assembly	.08	-.31	.11	-.08
Digit Symbol	.23	.17	.18	.27

n=49

Note

"*" denotes 2-tail significant at p< .01;
"**" denotes 2-tail significant at p< .001.

CHI - Chinese Language
ENG - English Language
MATHS - Mathematics
MEAN - mean of the results of the three examinations

CHAPTER FIVE

DISCUSSION

Development of the Vocabulary test

The Vocabulary subtest of the WAIS-RC was tested on a group of local adolescents aged 16-19. The response pattern of the subjects demonstrated that there was regional difference in word difficulty and thus item order. The vocabulary items were rearranged and thus a list of vocabulary items which suited the local situation was developed.

In relation to the regional difference, some of the responses of the Hong Kong adolescents to the vocabulary test were different from the criterion in the manual. For instances, the sixth vocabulary of the list, "通知" meant to inform, to make somebody known. Some subjects responded with an answer "公布" which was absent in the manual. Based on the personal communication with Dang, some of the responses which were different from the original scoring criterion were regarded as a pass as long as it satisfied the basic concept of the vocabulary. Some were regarded as failures when the responses connoted wrong concepts. Some amendments and addition towards the present scoring criteria were included in

the Appendix F.

In the present study, the order of the items was arranged according to the percentage of pass of the each word item by the subjects. As seen from Table 2, the 20th rank vocabulary, which was median point of the whole list had a pass percentage of 75.1 %. When it was compared to that of the WAIS (Wechsler, 1958), the percentage of pass of the 20th rank vocabulary for the total sample was 61% and for the age group 16 to 19 was 46%. The discrepancy might reflect that the first half of the list might be too simple and easy for the Hong Kong people and thus a high pass percentage was obtained. The sensitivity power of the test was doubted. A 75% pass percentage of the 20th rank vocabulary suggested that only 25% of the intelligence testees could be screened out when they reached half of the list. Based on the mentioned problem, further studies on the subtest might need to evaluate the items' discriminatory power. Items sharing similar pass percentage might be deleted if appropriate to make the list shorter for convenient administration and greater sensitivity.

In addition, comparison of the presently developed vocabulary test with that of the WAIS-RC may provide the gist for the regional difference in usage and level of difficulty of vocabulary.

Correlation study of the re-arranged vocabulary subtest

The final Vocabulary test correlated significantly with all other subtests of the WAIS-R. The results supported the thesis that the presently developed Vocabulary subtest should also be incorporated into the local WAIS-R testing administration.

Correlation coefficients were also computed for the 11 subtests against the results of the HKCEE. The significant correlation between the Vocabulary subtest and the Chinese Language examination and the mean of the three major examination papers established that the test was related to academic attainment.

In the present study, the usability of the Vocabulary test could only be correlated against the subtests of the WAIS-R which still did not have any validity study done in Hong Kong. Nevertheless, the inter-subtest correlations with other subtest and the communality value of the Vocabulary subtest provided an estimate of the feasibility of integrating the presently adapted subtest into the commonly used administration procedure of the WAIS-R in Hong Kong.

In the present study, the Vocabulary subtest of the WAIS-RC could be adapted in Hong Kong if item order was rearranged. The rearranged vocabulary subtest had high correlation coefficient with other subtests of the WAIS-R.

The present study adapted the WAIS-RC Vocabulary subtest into the local situation. A factor analysis was performed and the findings suggested that the factor pattern model extracted grossly simulated the traditional Verbal-Non-verbal factors. However, some subtests were loaded on both factors. Vocabulary subtest also had a significant loading on the Perceptual Organization factor. This might suggest that reading and understanding Chinese involved perceptual input in addition to the verbal one.

Limitations of the study

In the present study, subjects were of the age group from 16 to 19. Though the subject pool was formed by adolescents of various level of ability, the generalizability of the subtest to other ages might not be appropriate. The present study only covered the first two age groups in the WAIS or WAIS-R standardization sample. For an older sample, there might be variation in the level

of difficulty and responses. A sample which could cover the age range from 16 to 70 was ideal. Yet this might await the standardization of the local population that a more reliable test of vocabulary could be developed.

At present, there was not yet locally standardized cognitive assessment for the adult population. Other than the HK-WISC, the Raven's Progressive Matrices was the other locally standardized assessment for intellectual capacity. However, the standardization study included only children aged from 5 years 6 months to 15 years and 11 months (Education Department, 1986). In this way, the presently adapted vocabulary subtest could only infer its validity from academic attainment of the subjects.

In the present study, there was a significant correlation between the academic attainment of the subjects with the Vocabulary test. Subjects included in this validity study were all F.6 students who has reached the F.5 level and sat for the examination. Yet, those subjects who have not sat for the examination or not even reached the F.5 level were excluded. Further study on the concurrent validity of the test might employ the number of years of education as a criteria in order to test for those who have not taken the examination.

Implications for future work

The present study had an aim of studying the validity of the item-re-arranged vocabulary subtest. Using correlation and factor analysis procedures, it was demonstrated that the Vocabulary subtest could be included in the current WAIS-R local administration.

A side issue in the current study was the problem with the Digit Span. The results demonstrated that Digit Span might not be a stable and reliable measure among subtests of the WAIS-R when used in the local culture. A larger sample covering different intelligence ranges as estimated using the USA norm might be tested on the performance of the Digit Span. Similar to the HK-WISC and WAIS-RC, there might be some amendments in the administration of the Digit Span so as to suit the local situation.

Despite the usability and the validity study of the vocabulary subtest adapted, its inferential power of intelligence could not be established in the absence of standardization study. There is a need to have collaborative effort among the local practising psychologists to establish a norm for the local population.

Conclusion

The Vocabulary subtest of the WAIS-RC was used to study the feasibility of integrating it in the Hong Kong testing situation and its validity as applied in the local scene. The results showed that the item-re-arranged vocabulary subtest could be used in accordance with other subtests of the WAIS-R (Cantonese Administration). However, with the lack of standardization study for the local population and the possibly ceiling effect of the Digit Span test, further effort of research and study of the WAIS-R (Cantonese administration) was called for.

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APPENDIX A

詞匯 Vocabulary Item	現代漢語頻率①	漢詞詞匯統計②	香港初中中文詞彙③
1. 床鋪	11	3	
床	271	55	5
床上			28
床前			4
2. 美麗	151	84	79
3. 果園			4
果	49	38	
果子	38	15	
果實	48	22	
園林		26	
4. 修理	37	3	13
修建		14	
修改		31	
5. 疲倦	28	12	11
疲勞	32	16	
6. 通知	(動) 49	16	14
	(名) 17	18	
7. 曲折	41	12	8
8. 豐收	37	25	
豐盛			7
豐富			55
9. 工具	152	29	68
10. 謙虛	17	5	
謙遜			4

詞匯 Vocabulary Item	現代漢語頻率①	漢詞詞匯統計②	香港初中③ 中文詞条
11. 偽装	6		
偽			6
12. 速度	289	28	38
13. 堅定	91	25	5
14. 伙伴	33	17	3
15. 産品	194	18	91
16. 勝利	574	135	19
17. 輪船	62	17	12
18. 冬天	188	48	28
19. 和平	122	15	(名) 14 (形) 5
20. 糧食	152	34	27
21. 顛倒	19	3	3
22. 大方	28	5	(形) 9
23. 基礎	488	42	28
24. 進步	161	57	61
25. 機關	194	25	6
機構	72	4	53

Vocabulary Item 詞匯	現代漢語頻率①	漢詞詞匯統計②	香港初中③ 中文詞彙
26. 新鮮	66	25	48
27. 重要 重用		1	3
28. 累計	6	2	
29. 矛盾	279	13	13
30. 約束	9		4
31. 距離	98	18	(名) 161 (動) 29
32. 規矩	29		18
33. 堅壘	18	5	
34. 準繩 準定 準確 準則 準許 準	81 14	38	6 33
35. 笑柄 笑話	3	7	(名) 25
36. 淵博	7	4	
37. 里程碑 里程 里			

詞匯 Vocabulary Item	現代漢語頻率①	漢詞詞匯統計②	香港初中中文詞彙③
38. 系統	254	21	38
39. 妥協	14	1	3
40. 剽竊			

Note:

1. Modern Chinese Frequency Table
2. Statistics and Analysis of Chinese Vocabulary
3. The Study on Chinese Vocabulary of Junior Secondary School Students

APPENDIX B

1.	床鋪	Bed	21.	顛倒	Reverse
2.	美麗	Beautiful	22.	大方	Generous
3.	果園	Orchard	23.	基礎	Foundation
4.	修理	Repair	24.	進步	Improve
5.	疲倦	Fatigued	25.	機關	Organization
6.	通知	Inform	26.	新鮮	Fresh
7.	曲折	Tortuous	27.	貴重	Valued
8.	豐收	Abundant Harvest	28.	果斷	Decisive
9.	工具	Tool	29.	矛盾	Contradiction
10.	謙虛	Humble	30.	約束	Restraint
11.	偽裝	Pretend	31.	距離	Distance
12.	速度	Speed	32.	規矩	Custom
13.	堅定	Persistent	33.	堡壘	Castle
14.	伙伴	Campanion	34.	準繩	Criterion
15.	產品	Product	35.	笑柄	Laughing-Stock
16.	勝利	Champion	36.	淵博	Erudite
17.	輪船	Steamer	37.	里程碑	Milestone
18.	冬天	Winter	38.	系統	System
19.	和平	Tranquil	39.	妥協	Compromise
20.	糧食	Food	40.	剽竊	Plagiarize

APPENDIX C

香港中文大學臨床心理學碩士課程研究同意書

本人為就讀香港中文大學臨床心理學碩士課程研究生，現正進行一項研究作為畢業論文之用。本研究目的在於將一中文詞匯表整合在本港智力測驗之用。取得之資料只作研究用途及會絕對保密。在任何情況下，個人資料及測試結果將不予發表。

請閱讀以下的一段文字，如同意參加此項測驗者，請簽名：

本人完全明白我所給予的資料只會作研究之用。在任何情況之下，所有個人資料及測試結果將不予發表。

姓名：

簽名：

日期：________________________

見証人：________________________

日期：________________________

另本研究將會進行第二階段測試，將徵募一批受試者。此批受試者將接受一個完整及正式的智力測驗，研究員將提供測試結果資料予每一受試者。如有興趣，請填上聯絡電話號碼：

日間：________________________

夜間：________________________

請填寫以下各項：

姓名：---------- 性別：----------

年齡：---------- 出生日期：----------

曾在中國大陸居住年數：----------

教育程度（最高學歷）：----------

就讀中學類型：中文中學 / 英文中學（請刪去不適用者）

香港中學會考的年份與成績：

年份	科目	等第
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作答指示

請在以下各語句右側之空格上填上該詞語的意義，並加以說明，重複填上相同。

此表旨在測試你對每一個詞語的即時理解及反應，請你盡可能在三至五秒鐘內填上意思。另請勿在每個詞語上花太長的時間。

在每一詞項之最右有二個表，請在表上圖示出你對該詞語的熟悉度及你對該詞語的意義的信心程度。

多謝合作！

很不滿意	不滿意	普通	滿意	很滿意
1	2	3	4	5

很不重要	不重要	普通	重要	很重要
1	2	3	4	5

1.	----------	1	2	3	4	5	1	2	3	4	5
2.	----------	1	2	3	4	5	1	2	3	4	5
3.	----------	1	2	3	4	5	1	2	3	4	5
4.	----------	1	2	3	4	5	1	2	3	4	5
5.	----------	1	2	3	4	5	1	2	3	4	5
6.	----------	1	2	3	4	5	1	2	3	4	5
7.	----------	1	2	3	4	5	1	2	3	4	5
8.	----------	1	2	3	4	5	1	2	3	4	5
9.	----------	1	2	3	4	5	1	2	3	4	5
10.	----------	1	2	3	4	5	1	2	3	4	5
11.	----------	1	2	3	4	5	1	2	3	4	5
12.	----------	1	2	3	4	5	1	2	3	4	5
13.	----------	1	2	3	4	5	1	2	3	4	5
14.	----------	1	2	3	4	5	1	2	3	4	5

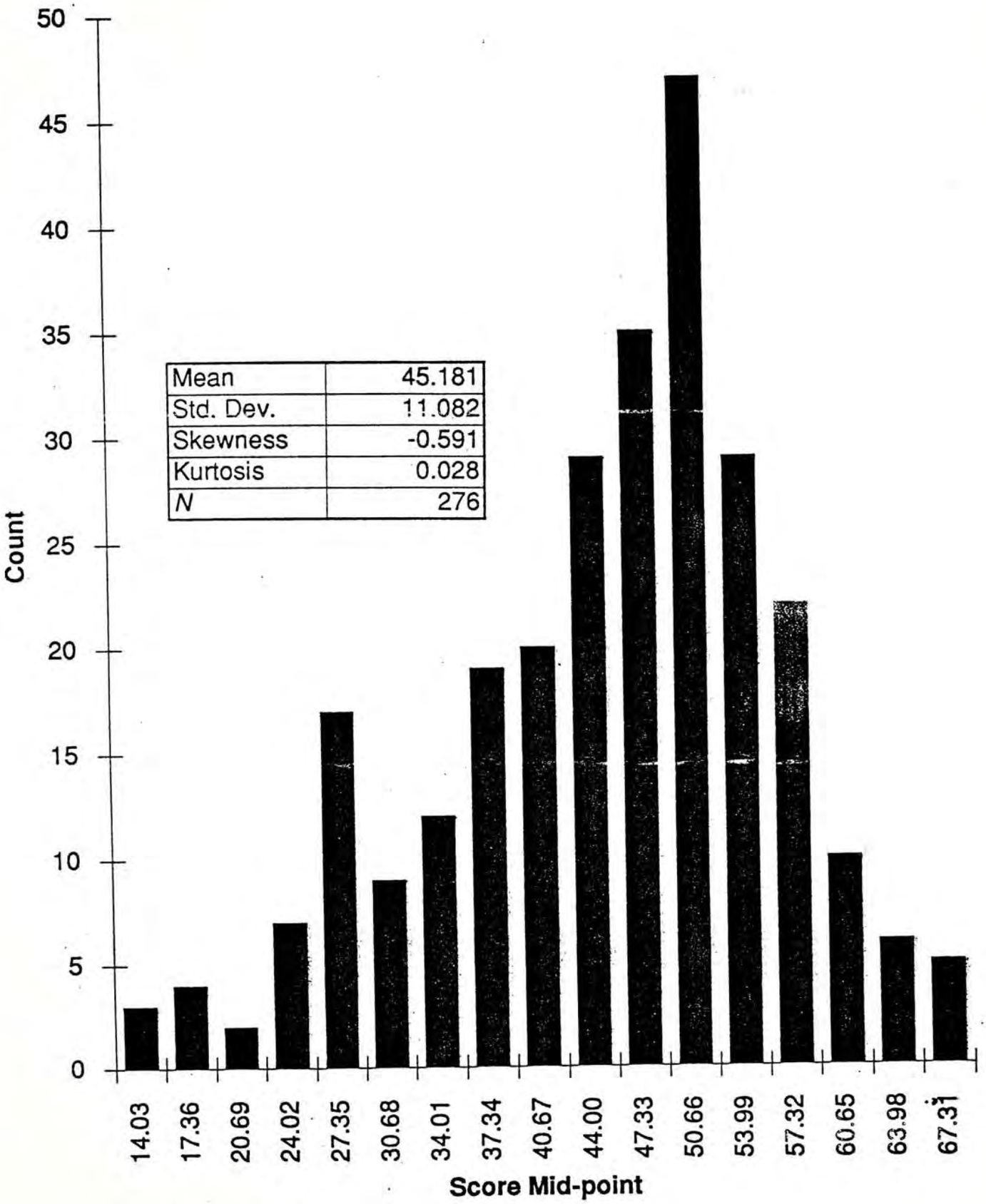
2	1	0

		很不同意	不同意	普通	同意	很同意	很不同意	不同意	普通	同意	很同意
15.	.....	1	2	3	4	5	1	2	3	4	5
16.	.....	1	2	3	4	5	1	2	3	4	5
17.	.....	1	2	3	4	5	1	2	3	4	5
18.	.....	1	2	3	4	5	1	2	3	4	5
19.	.....	1	2	3	4	5	1	2	3	4	5
20.	.....	1	2	3	4	5	1	2	3	4	5
21.	.....	1	2	3	4	5	1	2	3	4	5
22.	.....	1	2	3	4	5	1	2	3	4	5
23.	.....	1	2	3	4	5	1	2	3	4	5
24.	.....	1	2	3	4	5	1	2	3	4	5
25.	.....	1	2	3	4	5	1	2	3	4	5
26.	.....	1	2	3	4	5	1	2	3	4	5
27.	.....	1	2	3	4	5	1	2	3	4	5
28.	.....	1	2	3	4	5	1	2	3	4	5
29.	.....	1	2	3	4	5	1	2	3	4	5

2	1	0

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	1	0
30. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			
31. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			
32. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			
33. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			
34. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			
35. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			
36. [illegible] ------------------------	1	2	3	4	5	1	2	[illegible]	[illegible]				
37. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	[illegible]			
38. [illegible] ------------------------	1	2	3	4	5	[illegible]	[illegible]	[illegible]	[illegible]	5			
39. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			
40. [illegible] ------------------------	1	2	3	4	5	1	2	3	4	5			

APPENDIX D


50
45
40
35
30
25
20
15
10
5
0
Count
Mean 45.181
Std. Dev. 11.082
Skewness -0.591
Kurtosis 0.028
N 276
14.03
17.36
20.69
24.02
27.35
30.68
34.01
37.34
40.67
44.00
47.33
50.66
53.99
57.32
60.65
63.98
67.31
Score Mid-point

APPENDIX E

Percentage of Pass of 41 Vocabulary items

Item	%Pass	Rank	Item	%Pass	Rank
1 床鋪	17.6	38	21 顧倒	70.4	22
2 芙蓉	83.9	10	22 大方	55.6	29
3 果園	97.2	1	23 基礎	73.9	18
4 修理	91.5	3	24 進步	78.1	14
5 疲倦	85.9	7	25 幾個	20.4	37
6 通知	91.5	4	26 新鮮	33.1	34
7 曲折	69.7	23	27 照至	42.9	32
8 整收	78.2	13	28 果斷	61.9	27
9 工具	73.3	20	29 矛盾	28.[illegible]	35
10 證座	62.7	26	30 約束	64.[illegible]	25
11 偽裝	81.0	12	31 距離	64.[illegible]	24
12 速度	83.8	11	32 規矩	56.3	28
13 肯定	75.4	16	33 德望	50.[illegible]	31
14 伙伴	73.9	19	34 準繩	5.6	40
15 產品	73.2	21	35 笑柄	85.2	8
16 勝利	73.9	17	36 淵博	52.8	30
17 輸船	76.0	15	37 里程碑	7.0	39
18 冬天	91.5	5	38 系統	26.7	36
19 和平	89.5	6	39 妥協	37.3	33
20 糧食	84.5	9	40 剽竊	2.8	41
			41 床	95.0	2

Note. N = 142.

APPENDIX F

Local addition to scoring criterion

原本詞彙 Vocabulary Item	修改 Amendment
1. 床鋪	『床鋪』改為『床』
2. 美麗	答『吸引』記2分
3. 果園	
4. 修理	
5. 疲勞	
6. 通知	答『知會』記2分
7. 曲折	
8. 豐收	
9. 工具	
10. 謙虛	
11. 偽裝	
12. 速度	
13. 堅定	
14. 伙伴	答『拍擋』記2分
15. 產品	
16. 勝利	答『贏』記2分
17. 輪船	
18. 冬天	
19. 和平	
20. 糧食	

Appendix F (Cont'd)

原本詞彙 Vocabulary Item	修　改 Amendment
21. 顛倒	
22. 大方	答『不記仇』記2分
23. 基礎	
24. 進步	
25. 機關	
26. 新鮮	
27. 器重	答『賞識』記2分
28. 果斷	
29. 矛盾	
30. 約束	
31. 距離	
32. 規矩	
33. 堡壘	
34. 準繩	
35. 笑柄	
36. 淵博	
37. 里程碑	答『轉捩點』記0分
38. 系統	答『有組織』記2分
39. 妥協	
40. 剽竊	